

REMARKS

Applicant appreciates the detailed examination evidenced by the Official Action mailed May 23, 2005 (hereinafter the "Official Action"). Applicant also appreciates the indication that Claims 4 and 6 include patentable subject matter and would be allowable if rewritten as suggested by the Examiner. Applicant maintains, however, that the rejected claims are patentable over Sugaya as written (notwithstanding and amendment to Claim 5 to correct a typographical error therein). Applicant respectfully submits that all claims are patentable for at least the reasons described herein.

Independent Claim 5 has been amended to correct a typographical error.

Independent Claim 5 has been amended to correct a typographical error so that the claim now reads in-part: "so that a portion of the sidewall of the data storage **contacts the bottom electrode.** Applicant respectfully submits that this amendment is made to improve the readability of the claims and is not being made for purposes related to patentability, as a reasonable reader would have understood the original recitations to have the same meaning as the amended recitations.

Independent Claims 1, 5, and 24 are Patentable Over Sugaya

Claims 1-3, 5, 7-10 and 24 stand rejected under 35 U.S.C. §103 over what is referred to in the Official Action as "Applicant's admitted prior art (AAPA)" in view of U.S. Patent No. 6,844,268 to Sugaya ("Sugaya"). *Official Action, p. 2.* Applicant respectfully traverses the rejection, as even if the AAPA and Sugaya were combined, the combination would not disclose or suggest all the recitations of the pending claims, and furthermore, there is no clear and particular evidence of a motivation or suggestion to combine the AAPA and Sugaya as alleged.

Independent Claim 1 recites in part:

a bottom electrode having an interlayer dielectric layer thereon, the bottom electrode having a recess therein **that extends beyond a boundary between the bottom electrode and the interlayer dielectric;** and

a phase changeable layer in the recess including a protruding portion of the phase changeable layer that protrudes into the bottom electrode beyond the boundary.

Applicant respectfully submits that even if the AAPA and Sugaya were combined, the combination would not disclose or suggest at least the recitations highlighted above. To establish a *prima facie* case of obviousness, three basic criteria must be met. The prior art reference (or references when combined) must teach or suggest all the claim limitations. There must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings, and there must be a reasonable expectation of success of the combination. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. See M.P.E.P. § 2143. As stated by the Court of Appeals for the Federal Circuit, to support combining references in a § 103 rejection, evidence of a suggestion, teaching, or motivation to combine must be clear and particular, and this requirement is not met by merely offering broad, conclusory statements about teachings of references. *In re Dembiczak*, 50 USPQ2.d 1614, 1617 (Fed. Cir. 1999).

For example, Figure 3 of Applicant's background shows the phase changeable layer **18** on the contact plug **16**. As understood by Applicant, Figure 10I of Sugaya shows recess **49** having a dielectric film **45** formed therein and a poly layer thereon. According to Figure 10I, the poly layer does not extend beyond a boundary between the bottom electrode and the inter dielectric layer (*i.e.*, the dielectric layer **45**) as recited in the claims.

In contrast to Sugaya, in some embodiments according to the invention as shown for example in Figures 6 and 7 of the application, a recess is formed that actually extends beyond the boundary between the dielectric layer **56** and the bottom electrode **54**. Moreover, the phase changeable layer **62** protrudes into the bottom electrode beyond the boundary. Accordingly, even if the AAPA and Sugaya were combined, the combination would not disclose or suggest all the recitations of independent Claim 1. Independent Claims 5 and 24 include similar recitations.

Moreover, the Official Action appears to have not considered the recitation discussed above. For example, in examining Claim 1, the Official Action reads:

With respect to claims 1 and 24, AAPA teaches a structure in a phase changeable memory cell, comprising (see figs. 1-3 and associated text of this application):

a bottom electrode 12 layer interlayer dielectric layer 14 therein; and a phase changeable layer 18 over the dielectric layer and the bottom electrode.

However, AAPA fails to teach that the bottom electrode having a recess and the phase changeable layer is formed in the recess.

Sugaya teaches a similar structure in a memory cell in which a bottom electrode 48 having recess, a dielectric layer is formed in the recess of the bottom electrode, and a upper electrode is formed over the dielectric layer. See fig 10I and associated text.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to incorporate Sugaya's teaching into the AAPA's structure to improve write and erase characteristics of the memory cell. See col. 14, lines 35-40.

The above cited portion of the Official Action examining Claim 1 makes no reference to the recitations discussed above by Applicant. It does not appear the Official Action has given any weight to the highlighted recitations.

In addition to the reasons described above, Applicant also respectfully submits that there is no clear and particular evidence of a motivation or suggestion to combine the AAPA with Sugaya. For example, the disclosure of Sugaya relates to a generic formation of recesses used for example in capacitors whereas the AAPA relates specifically to phase changeable material based memory devices.

Furthermore, one of ordinary skill in the art would not have been motivated to combine the AAPA with Sugaya as one would not have had a reasonable expectation of success. In particular, as described above, the Official Action appears to consider the silicon nitride layer to disclose the inter layer dielectric recited in the present claims. However, even if this were assumed to be true for the sake of argument, placing the phase changeable material from the AAPA into the recess on the silicon nitride may not provide proper operation of a phase changeable memory device as the silicon nitride may insulate the phase changeable material from the lower electrode.

Accordingly, Applicant respectfully submits that there would be no reasonable expectation of success in combining the AAPA and Sugaya as required under section 103

In addition to the above, the rationale given by the Official Action in support of the combination of the AAPA and Sugaya does not meet the stringent requirements of clear and particular evidence of a motivation or suggestion to combine the references as required under Section 103. In fact, the Official Action cites the following motivation in support of the combination:

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to incorporate Sugaya's teaching into the AAPA's structure to improve write and erase characteristics of the memory cell. See col. 14, lines 35-40. (Official Action, p. 3)

The above cited passage of the Official Action represents the entire motivation as cited by the Official Action in support of the combination, which Applicant submits is conclusory in nature. Applicant, therefore, respectfully submits that the above passage relied on by the Official Action is not sufficient to meet the requirements of a rejection under Section 103.

Accordingly, independent Claims 1, 5 and 24 are patentable over the AAPA and Sugaya for at least the reasons described herein. Furthermore, dependent Claims 2-4, and 6-10 are patentable for at least the reasons described above in reference to the independent claims.

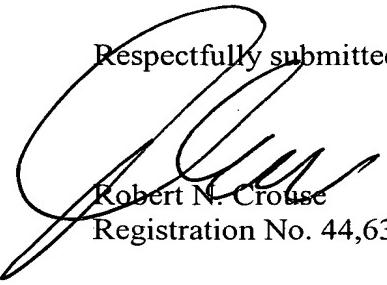
CONCLUSION

Applicants have shown herein that even if the AAPA and Sugaya were combined, the combination would not disclose or suggest all the recitations of the pending claims. Furthermore, Applicants have also shown that there is no clear and particular evidence of a motivation or suggestion to combine the AAPA and Sugaya as required under Section 103. Clearly, Applicant respectfully requests the withdrawal of all rejections and allowance of all claims in due course. If any informal matters arise, the Examiner is encouraged to contact the undersigned by telephone.

In re: Se-ho Lee
Serial No.: 10/692,578
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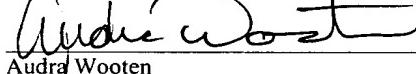
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